NATURAL RESOURCES CONSERVATION SERVICE
CONSERVATION PRACTICE STANDARD

SOLID/LIQUID WASTE SEPARATION FACILITY

(No.)
CODE 632

DEFINITION

A filtration or screening device, settling tank, settling basin, or settling channel used to separate a portion of solids from a liquid waste stream.

PURPOSE

To partition solids, liquids, and their associated nutrients as part of a conservation management system to:

- Improve or protect air quality.
- Improve or protect water quality.
- Improve or protect animal health.
- Meet management objectives.

CONDITIONS WHERE PRACTICE APPLIES

This practice applies where solid/liquid separation will:

- Reduce solids accumulation in liquid storage facilities.
- Reduce solids in stored liquids so liquids can be used for other purposes.
- Assist with partitioning nutrients in the waste stream to improve nutrient management.
- Remove solids from the waste stream as a primary treatment process to facilitate further treatment processes such as composting and anaerobic digestion.

CRITERIA

Laws and Regulations. Waste treatment facilities must be planned, designed, and constructed to meet all federal, state, and local regulations.

Location. Separation facilities shall be located so that the waste stream can be safely routed to and from the facility.

Separator Selection. **Table 1** provides guidance on the different types of separators available. Capture efficiency varies widely for each type of separator depending on the type and consistency of the waste to be treated. The type of separator selected shall be based on site specific data for the liquid waste stream and management conditions where specific management objectives are to be met.

Separation Efficiency. The volume of solids separated shall be based on estimates of daily waste water volume and the total solids capture efficiency for the type of separation device selected. If manufacturer information or local data concerning total solids capture efficiencies are not available for the type of separation device selected, the efficiencies in **Table 1** can be used to estimate the volume of separated solids generated.

Table 1

Solid/Liquid Separators	Total Solids Capture Efficiency
Static Inclined Screen	10-20%
Inclined Screen with Drag Chain	10-30%
Vibratory Screen	15-30%
Rotating Screen	20-40%
Centrifuge	20-45%
Screw or Roller Press	30-50%
Settling Basin	40-65%
Weeping Wall	50-85%
Dry Scrape	50-90%
Geotextile Container	50-98%

Storage of Separated Solids. Adequate storage areas shall be provided for separated solids so they can be properly managed.

Storage facilities for separated solids shall be designed in accordance with Conservation Practice Standard 313, Waste Storage Facility.

All seepage from solid storage facilities shall be directed to liquid storage facilities.

Chemical Amendments. Guidance for adding chemicals to the liquid waste stream for improving total solids capture efficiencies is given in Conservation Practice Standard 591,

Amendments for Treatment of Agricultural Waste.

Outlets. The outlet capacity for a separation facility shall be capable of safely conveying the design capacity to a storage or utilization location.

Outlets may include pipelines, perforated or slotted pipe risers, porous plank walls or dams, or screened walls. Screening used to separate solids at the outlet of settling basins should provide at least 10% open area.

An auxiliary overflow device, such as a notched weir or pipe bypass, can be used to control flows exceeding design capacity. These devices shall be designed to pass the peak runoff from the drainage area of the facility for a 25 year-24 hour storm frequency plus the normal waste stream discharge. Discharge from the separation facility must be captured in a waste storage or treatment structure unless it meets local, state, and federal regulations regarding discharge to surface and ground waters.

Additional Criteria for Filtration or Screening Devices

Flow Rate and Velocity. The design flow rate and waste stream velocity for filtration and screening devices shall be in accordance with the manufacturer's recommendations.

Structural Design. Structural supports for filtration and screening devices shall be designed in accordance with the requirements of Conservation Practice Standard 313, Waste Storage Facility.

General Criteria for Settling Basins

Velocity. The liquid waste stream velocity through settling basins shall not exceed 1.5 feet per second.

Minimum Depth. The minimum liquid depth of settling basins shall be based on a minimum hydraulic retention time and the solids settling rate. A minimum hydraulic retention time of 30 minutes shall be used except where sand is a major component of the liquid waste stream. Where sand is a major component in the liquid waste stream the hydraulic retention time shall be a minimum of 3 minutes and a maximum of 5 minutes.

The maximum solids settling rate used for design shall be 4 feet per hour for settling basins with a total storage depth greater than 2 feet and 2 feet per hour for settling basins with a total storage depth equal to or less than 2 feet.

Maximum Depth for Cleaning Purposes. If the total depth for settling basins that are to be cleaned out using conventional front end loading equipment exceeds 5 feet, additional safety concerns, for cleanout purposes, shall be addressed.

Freeboard. Current NMED regulations require that all embankment waste storage facilities to have a minimum 2 feet of freeboard. This is in addition to the depth needed for liquids and solids storage.

Concrete. The total depth of concrete settling basins shall be based on the depth needed for liquids and solids storage plus 1 foot of freeboard.

Bottom Width. The minimum bottom width for settling basins shall be 10 feet.

Lining. All earthen settling basins shall be lined with concrete or per the requirements of Conservation Practice Standard 521A, Pond Sealing or Lining – Flexible Membrane.

A settling basin not utilizing a concrete slab for the basin floor shall be designed to provide adequate support for clean out equipment. A settling basin constructed according to these criteria shall also meet appropriate criteria in Conservation Practice Standard 313, Waste Storage Facility.

Access. The minimum top width of earthen embankments for settling basins shall be 15 feet where equipment access is needed for clean out. Where no access is needed for clean out, the minimum top width shall be governed by the equipment used to construct the embankment or berm, but shall not be less than 8 feet.

The side slopes of earthen embankments shall be 3 horizontal to 1 vertical (3:1) or flatter.

Access ramps to allow entry into the basin for clean out by normal front end loading equipment shall be no steeper than 10:1. Steeper slopes shall be allowed where special surfacing of the ramp is done for traction

purposes and the equipment used can accommodate the steeper slope but in no case shall the access ramp be steeper than 4:1.

Additional Criteria for Settling Basins Receiving Lot Runoff

Flow rate. The design flow rate for a settling basin that receives lot runoff shall be based on the normal liquid waste stream discharge from the operation plus the peak runoff from the drainage area of the basin computed using a 25 year-24 hour storm frequency.

Inlet. Diversions to settling basins can use an earthen bottom. The inlet structure shall be designed and constructed to be non-erosive.

Volume. The design volume for settling basins receiving lot runoff shall be based on the total depth needed for liquid and solids storage and the minimum surface area required for the basin.

Additional Criteria for Settling Basins that Exclude Lot Runoff

Flow Rate. The design capacity for a settling basin that excludes lot runoff shall be based on the normal liquid waste stream discharge from the operation.

Volume. The design volume for settling basins that exclude lot runoff shall be the volume needed to provide solids storage for a specified treatment period plus temporary liquid storage necessary during dewatering. Minimum temporary liquid storage shall be based on the volume of the liquid waste stream for one-day.

CONSIDERATIONS

Energy. Separation facilities should take advantage of gravity flow wherever possible, to reduce pumping cost.

Location. Location of separation facilities should consider elevation and distance from the source of material to be separated and the location of long-term liquid and solid waste storage facilities.

Other considerations for locating separation facilities include vehicle access, wind direction, neighboring dwellings, proximity of streams and floodplains, and visibility.

Weeping Walls. To maximize drainage and separation, weeping walls should be used on the entire perimeter of the waste to be treated and drainage paths maintained to and through the walls. Ensure drainage is transferred to a liquid storage facility.

Waste Water Transfer Piping. It is common practice to route flow to and from a separation facility using pipe. Use Conservation Practice Standard 634, Manure Transfer for guidance in designing pipelines for waste water transfer.

Visual Screening. Vegetative screens or other methods should be considered to shield separation facilities from public view and for more aesthetic conditions.

Rainfall. Rainfall falling on the solids storage areas associated with separation facilities can result in increased waste water discharge into the long term storage facility.

Operation and Maintenance. Where sand is a major component of the liquid waste stream, special emphasis should be given to abrasion resistant waste transfer piping and pumps to reduce frequency of repairs.

The owner and operator should understand the level of operation and maintenance (O&M) required ensuring the type of separator selected will be operated as intended.

PLANS AND SPECIFICATIONS

Plans and specifications shall be prepared in accordance with the criteria of this standard and good engineering practice. The plans and specifications shall include all details necessary for construction and completion of the separation facilities.

As a minimum, the plans and specifications shall provide the following:

1. Layout of waste production facilities, waste collection points, waste transfer pipelines, waste treatment, and storage facilities.
2. Location of all inflow and discharge pipelines and a description of pipeline materials, diameter, and slope.
3. Details of support systems for separators.
4. Fencing and signage as appropriate for safety purposes.
5. Operating characteristics.

Warranties. The contractor shall provide a one-year warranty on all construction. If a manufactured separation device is installed, the manufacturer shall provide a warranty that

describes the design life of the device and what the warranty covers.

OPERATION AND MAINTENANCE

An operation and maintenance (O&M) plan shall be developed and reviewed with the owner and operator prior to constructing the separation facility. The O&M plan shall be consistent with the purposes of the device chosen, its intended life, safety requirements, and the criteria for its design. The plan shall contain operation and maintenance requirements including but not limited to:

1. Documentation of design assumptions.
2. Design capacity for the facility.
3. A description of normal operation of the facility, safety issues, and normal maintenance items.
4. Alternative operation procedures in the event of equipment failure.
5. Daily inspection of the following:
   - Separation device and structure.
   - Screens and outlets.
   - Remaining capacity in storage facilities.

REFERENCES

1. USDA/NRCS, National Engineering Handbook, Part 651, Agricultural Waste Management Field Handbook.1992, Last revised, June 1999.
2. Mid West Plan Services Handbook 18, Livestock Waste Facilities Handbook, Third Edition, 1993.
3. Burns, R.T. and Moody, L.B.. 2003. Development of a Standard Method for Testing Mechanical Manure Solids Separators. ASAE-CIGR Meeting Paper No. 034131. St. Joseph, MI.: ASAE